Burrowing Owl

Brian K. Jeffery

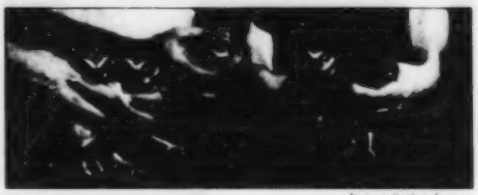
"Have you seen any burrowing owls lately?"

If you asked this question twenty years ago, the answer you might have received was "not as many as there used to be." Today, a more common response is, "none for the last few years."

With the advent of modern agricultural practices, there has been a noticeable decline in burrowing owl (*Athene cunicularia*) numbers across the prairies. In 1975, biologists conducted surveys across the prairies to determine the status of the species in Canada, and subsequently, burrowing owls were listed as threatened in 1978 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). A threatened designation means there is a possibility that the species could become endangered if factors causing the decline are not addressed. In 1995, with numbers of owls continuing to decline, the owl was in fact uplisted to an endangered status. Today, there is the real possibility that burrowing owls may become extirpated (i.e. they will no longer occur) from Canada in the near future.

National Recovery Plan for the Burrowing Owl

In 1995, the National Recovery Plan for the Burrowing Owl was developed to increase populations of the burrowing owl in Canada to self-sustaining levels. The goal of the Recovery Plan is to maintain a stable or increasing population averaging 3,000 pairs in the prairie provinces (now estimated at less than 1,000 pairs).


Nature Saskatchewan

The Recovery Plan outlines seven strategies to attain its goals:

1. Reduce mortality on the breeding grounds.
2. Increase productivity.
3. Protect and manage nesting habitat.
4. Monitor populations.
5. Determine need for management on migration and wintering areas.
6. Conduct release programs.
7. Develop public support through education.

Research needs are identified in the Recovery Plan and research results, in turn, guide recovery activities.

What makes a population decrease or increase?

Populations decrease if the number of individuals leaving are greater than those joining the population. A bird leaves the population if it dies or emigrates to a different location. Reproduction and immigration add birds to a population.

Results from research help establish the factors causing the population decline, and direct strategies aimed at reversing the current downward population trend.

Tools of the Trade

Bands - not of the musical variety

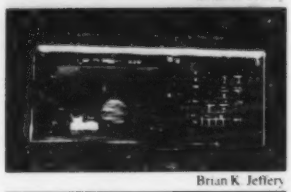
Banding is used to monitor locations and movements of owls on and off breeding areas. Individually marked owls provide us with good information on adult and juvenile mortality, return rates from the wintering grounds, and fidelity to and dispersal distances from previous nest sites. For juveniles, we learn about dispersal distances from the nest site after fledging.

Two types of leg bands are placed on burrowing owls; a numbered USFWS (United States Fish and Wildlife Service) aluminum band, and one to three coloured plastic bands. Leg bands are placed in a unique combination so that individuals can be distinguished without recapturing the owl. Bands can be seen from a distance using either binoculars or a spotting scope. Banding returns and observation indicate that wearing bands does not affect survival or behaviour. Please report banded birds to the HOOT-line (1-800-667-4668).

Brian K. Jeffery

Radio-Telemetry - keeping track of owls

Brian K. Jeffery



Brian K. Jeffery

Brian K. Jeffery

Brian K. Jeffery

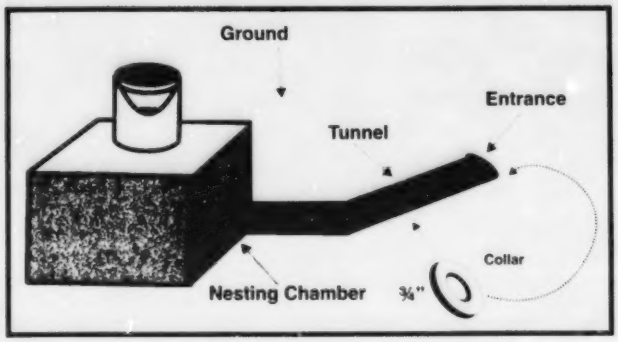
Radio-telemetry is an important research tool and is used in the study of a variety of animals. It can provide information on habitat use, movements and activity, and causes and rates of mortality in breeding and wintering areas and along migration routes.

How does radio-telemetry work? Two pieces of equipment are needed: a transmitter and a receiver. A battery-operated transmitter, about the size of a peanut, emits a radio signal at a designated frequency. It is worn around the owl's neck like a necklace, and has a flexible antenna extending behind the bird's head. The radio receiver can select different frequencies. If it is tuned to the same frequency as the owl's transmitter, it begins to beep. A directional antenna can be attached to the receiver enabling the radio to beep louder when the antenna is pointed towards the owl than when it is pointed away from the owl. The owl is located by moving in the direction of the loudest sound.

Artificial Nest Boxes - prefabricated homes

Artificial nest boxes (ANBs) are used to facilitate research studies, and to enhance survival of nests by reducing predation. They allow biologists to gather information on egg laying dates, clutch size, the onset of incubation and incubation period, hatching dates, nest success, and growth and development rates of nestlings. Prey caches in ANBs indicate relative prey abundance and species composition of larger prey items.

Artificial nest boxes are installed before egg laying begins at occupied natural burrows. From ground-level they look the same as natural burrows. An ANB consists of a wooden box and a metal grate in place of the bottom. A dirt-filled removable bucket nested within a second bucket, that is secured at the top, serves as a lid for the hole and provides insulation from heat or cold. By lifting this bucket, biologists have access the nest chamber. The bottom grate stops badgers and other fossorial (burrowing) mammals from digging under the nest chamber and allows water to drain out of the nest. The tunnel consists of weeping tile, and is fixed with a collar, an arm's length from the entrance, to



restrict access by mammalian predators such as skunks and racoons. The bottom of the tunnel and nest chamber are lined with dirt and dried, shredded manure to resemble natural owl burrows.

To Catch an Owl

In order to band or radio tag an owl, it needs to be captured. Juveniles and females are often captured inside an artificial nest box. However, if an owl is using a natural burrow or if it is not entering the ANB upon approach (male owls), noose carpets or bow nets are used. A noose carpet is constructed by attaching slip knots (small nooses) made of fishing line to a wire mesh so that it resembles a shag carpet. The noose carpets are placed on the burrowing owl's mound near the burrow entrance, and the mesh is covered with soil so that only the nooses are exposed. Usually, dead mice are placed on the carpet to entice the owl to walk on it. When a toe gets snagged in a loop, it tightens so that the bird cannot fly away.

Biologists wait nearby so they can retrieve the owl immediately upon capture. This method is not always successful in capturing the owl. It may take several attempts before an owl is trapped by the noose carpet. Approximately one third of the owls are not banded in the Regina Plain study area because researchers are unable to capture them.

Operation Burrowing Owl Census Cards

Participants of Operation Burrowing Owl, a voluntary prairie stewardship program, report annually whether or not they have nesting owls, and if so, how many pairs. They also report land uses and any changes surrounding the nesting area. These survey results are important in detecting changes in the owl population from year to year, and also provide data on distribution and habitats available for nesting.

Research in the Regina Plain

1. Increasing survival of eggs and young

Does the amount of food available affect the number of young produced? In turn, does an increased number of young lead to an increased population size? To answer these questions, biologists conducted a five-year study in the 1990's to determine the effect of food availability on owl productivity. Some owl nests were supplemented with additional food (lab mice and quail); others were not. In addition, artificial nest boxes (ANB) were installed to prevent nest predation.

The study showed productivity (survival of eggs and young) can be significantly increased using supplemental feeding and ANBs. In most years, it appeared there was not sufficient prey to provide enough food to maximize the number of young fledged. Fed nests produced an average of 7 to 8 fledglings, whereas unfed nests produced about 5 fledglings. However, the increased number of young fledged by these means did not result in an increase in the study area's owl population the next year.

1997 - let them eat voles!

In 1997, there was a large meadow vole population across the prairies. Extremely large prey caches of voles were found at some nests. Because of the abundant prey in this year, burrowing owls likely had sufficient food to maximize productivity. In the following year, 1998, there was a noticeable increase in the number of nesting pairs. This population increase was likely due to a combination of factors in 1997, including:

- more young fledged;
- juveniles had abundant food after fledging and were likely in better condition before they migrated. Therefore, more young survived after fledging to return to breed in the next year;
- predators had an alternate prey source and preyed less on owls than in other years;
- abundant prey across the prairies enhanced owl productivity on a large scale. In 1998, more owls immigrated into the study area, increasing the local population.

The large vole population was likely due to a combination of factors, including a good snow cover over the winter, and an early snow that left some crops still standing. These factors provide good habitat for reproduction and survival of voles.

2. Adult male foraging habits (hunting for food)

Male burrowing owls provide food to the female and young during the nesting period. In the mid 1980's, a radio-telemetry study conducted near Saskatoon examined foraging behaviour, home ranges, and activity patterns of burrowing owls. Although originally perceived as a diurnal species, this study found that most foraging occurred at night. Males hunted in grass-forb areas approximately 30 cm in height, and avoided crop lands and grazed pastures. Mean home range size was 2.41 km^2 (range 0.14-4.8 km^2), and foraging occurred as far as 2.7 km from the nest. However, 95% of owls were located within 600 m of the nest.

In a similar study in the Regina Plain in 1997, home ranges were substantially smaller (mean 0.35 km^2, range 0.08 - 0.49 km^2). Owls likely did not have to travel as far for food due to the high number of voles in 1997, suggesting that owls can alter their foraging patterns depending on the availability of prey. Research on male foraging is continuing in Alberta.

3. Ecology of juvenile owls after fledging

In a radio-telemetry study investigating juvenile dispersal and mortality, chicks fitted with transmitters just prior to fledging are monitored until migration. Thus far, three patterns of juvenile dispersal have been identified: (1) remaining at the nest burrow for the duration of the summer, (2) moving to a new burrow (generally quite far from their nest), and remaining there until migration, and (3) moving farther and farther from the nest, choosing a different burrow each time. Ongoing work is examining if habitat fragmentation affects dispersal behaviour.

Hawk predation on juvenile owls was high in 1998 and 1999 compared to 1997. The high meadow vole population in 1997 likely had a positive effect on juvenile survival by providing predators with alternate prey.

4. Release of captive-bred owls

In a pilot captive release program, initiated in 1997, one-year-old captive-born burrowing owls were paired, placed in release cages in suitable nesting habitat, and set free after three days. Although released birds successfully produced young, survival may be lower than in wild pairs, and adult owls appear less likely to migrate. Further research is needed on captive-bred owl behaviour and effective release techniques. Release of captive-bred owls is not planned until causes of the overall decline are addressed.

5. Migration and wintering areas research

In 1997, 13 owls in the Moose Jaw area, were fitted with radio transmitters and tracked as they left on migration. Generally, these owls flew in a south-southeast direction. They flew at night, although not necessarily every night, travelled on average 186 km during an evening (range 109 - 326 km), and stopped in areas similar to their nesting habitat. Two owls were tracked as far as Dickinson, ND. Three owls returned to Moose Jaw in the spring with radio transmitters still attached.

Doug Grier

In December 1997, in south Texas, biologists found the first banded Saskatchewan owl believed to be at its wintering grounds. Only nine other migrating owls have been recovered from more than 3,000 owls banded to date in Canada. In December 1998, signals from two radio-tagged owls were picked up, one again in Texas and one in Mexico, just south of the United States border. No radio-tagged owls were located in 1999.

Landowner's Role in Research

In Saskatchewan, the majority of owls nest on privately owned land. Landowner interest and cooperation are vital to burrowing owl research. The owl population is monitored through almost 500 Operation Burrowing Owl landowners who annually report on nesting owls. Landowners allow access onto their property, direct researchers to possible nest locations, consent to the installation of artificial nest boxes and, most importantly, maintain and enhance burrowing owl nesting habitat. Without their help, knowledge gained from owl research would be greatly diminished.

A Word of Thanks!

Support for this research is gratefully acknowledged:
Canadian Council for Human Resources in the Environment Industry: Environmental Youth Corps Internship Program
Enbridge Pipelines Inc.
Environment Canada: Canadian Wildlife Service
Environment Canada: Science Horizons Youth Internship Program
Foothills Pipelines Limited
Nature Saskatchewan: Saskatchewan Lotteries
North Dakota Game and Fish Department
Saskatchewan Environment and Resource Management
The Canadian Society of Environmental Biologists
TransCanada Pipelines
TransGas Limited
University of Alberta
University of Regina
University of Saskatchewan
Wildlife Preservation Trust Canada
World Wildlife Fund and the Canadian Wildlife Service of Environment: Canada Endangered Species Recovery Fund

For more information, contact:

Operation Burrowing Owl
c/o Nature Saskatchewan
Room 206, 1860 Lorne Street
Regina, SK S4P 2L7
Tel: (306) 780-9273 Tel: 1-800-667-HOOT (4668) Fax: (306) 780-9263
E-mail: nature sask@unibase.com

Saskatchewan Environment and Resource Management
Fish and Wildlife Branch
4th Floor, 3211 Albert Street
Regina, SK S4S 5W6
Tel: (306) 787-2314 Fax: (306) 787-9544

Saskatchewan Burrowing Owl Interpretive Centre
Box 1467
250 Thatcher Drive
Moose Jaw, SK S6H 4R3
Tel: (306)692-8710 Fax: (306)693-2762 E-mail: sboic@sk.sympatico.ca

Saskatchewan Environment and Resource Management